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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/561,215	12/19/2005	Masafumi Sakuma	Q91310	4045

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SUGHRUE MION, PLLC
2100 PENNSYLVANIA AVENUE, N.W.
SUITE 800
WASHINGTON, DC 20037

EXAMINER	
KIM, JOHN K	

ART UNIT	PAPER NUMBER
2834	

MAIL DATE	DELIVERY MODE
05/14/2008	PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No.	Applicant(s)	
	10/561,215	SAKUMA ET AL.	
	Examiner	Art Unit	
	JOHN K. KIM	2834	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE *3* MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *19 December 2005*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-5* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-5* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *19 December 2005* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☒ All b)☐ Some * c)☐ None of:

1.☒ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date *12/19/2005, 4/10/2007*.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

Claim Rejections - 35 USC § 112

1. The following is a quotation of the second paragraph of 35 U.S.C. 112:

> The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

2. Claims 1 and 2 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

As for claim 1, the examiner copied section from Fig. 3 below. Claim 1 recites "... in a back yoke portion of the stator corresponding to a tooth (2 or 4)' (which is) adjacent a tooth (3) located between an adjacent pair of said stator windings (left side winding and right side winding) which form magnetic poles in a same phase (third phase) with different polarities ...". However, the examiner regards this sentence especially underlined phase is indefinite to convey the clear meaning. The examiner interprets "... the tooth (3) which is located between an adjacent pair of said stator windings (left side winding and right side winding) which form magnetic poles in a same phase (third phase) with different magnetic polarities ...".

Claim 2 recites "... a two-phase rectangular wave drive mode, ..." but the phrase is indefinite. The motor is of three phase, and therefore the drive has to be three phase drive. The phrase can be confused as if the driver is of two phase. The examiner guess it is intended to drive two phases on out of three phase mode like six steps trapezoidal BLDC motor or three phase switched reluctance motor drive. Therefore, in

order to avoid confusion, the examiner interprets the phrase "... a two-phase-on rectangular wave drive mode, ... ". Appropriate correction is required.

Claim Rejections - 35 USC § 103

3. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

4. The factual inquiries set forth in *Graham* **v.** *John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.
4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

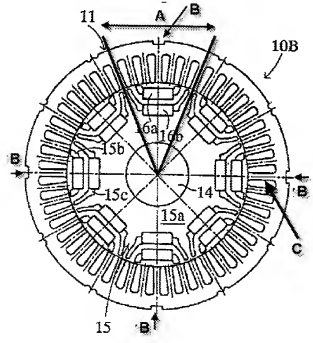
5. Claims 1 and 3-5 are rejected under 35 U.S.C. 103(a) as being unpatentable over Sakuma et al (US 2003/0094875) in view of Nishiki (US 6211593) and in further view of Kazmierczak (US 2003/0001450).

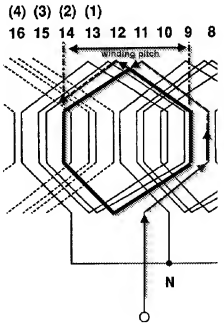
As for claim 1, Sakuma teaches (in Fig. 2) a three-phase synchronous reluctance motor (10b) comprising a rotor (15) and a stator (11) having a plurality of teeth formed in an inner face thereof along a peripheral direction and in opposition to said rotor (15), six of said teeth (see A in sketch below) being in opposition to one of a plurality of rotor magnetic poles provided in the rotor (15), there is provided at least one width reducing portion (see B in sketch below) which renders a width of a magnetic path of the back yoke portion (at numeric 11 pointed) of the stator (11) reduced relative to a width of a magnetic path of the back yoke portion corresponding to the other teeth,

Sakuma, however, failed to teach or suggest stator having stator windings by a coil pitch corresponding to five teeth of said six teeth, wherein in a back yoke portion of the stator corresponding to a tooth adjacent a tooth located between an adjacent pair of said stator windings which form magnetic poles in a same phase and with different polarities in a three-phase drive mode,

In the same field of endeavor, Nishiki teaches (in Fig. 14, and right side sketch below) stator having stator windings by a coil pitch corresponding to five teeth of said six teeth (col. 12, line 63-64; pole pitch is 6 and winding pitch is 5 for both motors), , in a three-phase drive mode (Fig. 11). Therefore, it would have been obvious to a person of ordinary skill in the art at the time the invention was made to combine the teaching of Nishiki with that of Sakuma for reduction of torque ripple. Therefore, it would have been obvious to a person of ordinary skill in the art at the time the invention was made to combine the teaching of with Nishiki that of Sakuma for high efficiency drive.

The references, however, failed to teach wherein in a back yoke portion of the stator corresponding to a tooth adjacent a tooth located between an adjacent pair of said stator windings which form magnetic poles in a same phase and with different polarities. In the same field of endeavor, Kazmierczak teaches (in Figs. 1-2) in a back yoke portion of the stator (10) corresponding to a tooth (between slots 14-15 or 16-17) adjacent a tooth (between slots 15-16) located between an adjacent pair of said stator windings which form magnetic poles (poles 1 and 2) in a same phase and with different polarities. Therefore, it would have been obvious to a person of ordinary skill in the art at the time the invention was made to combine the teaching of Kazmierczak with those of Sakuma and Nishiki for harmonic reduction.





As for claim 3, Sakuma and Nashiki and Ehsani teach the claimed invention as applied to claim 1 above. Sakuma further teaches (in Fig. 2) wherein a center position

of said width reducing portion (see B in sketch in claim 1 above) and a center position of said tooth are aligned with each other along the peripheral direction of the stator (11), and said width reducing portion (see B in sketch in claim 1 above) is formed along the peripheral direction of the stator by an area smaller than two pitches of the teeth (see C in sketch in claim 1 above).

As for claim 4, Sakuma and Nashiki and Ehsani teach the claimed invention as applied to claim 1 above. Sakuma further teaches (in Fig. 2) a plurality of said width reduced portions (B in sketch in claim 1 above) are provided along the peripheral direction of the stator by a pitch of n/3 (n: a natural number) of the pitch of the rotor magnetic poles. (in this case, n=6 and therefore, the width reduced portions pitch is 90 degree while pitch of the rotor magnetic poles is 45 degree)

As for claim 5, except claim dependency, claim 5 contains the same limitation as claim 4 and is rejected for the same reason set forth in connection with the rejection of claim 4 above.

6. Claim 2 is rejected under 35 U.S.C. 103(a) as being unpatentable over Sakuma et al (US 2003/0094875) in view of Nishiki (US 6211593) and in further view of Kazmierczak (US 2003/0001450) and Iijima et al (US 6081087).

Sakuma teaches (in Fig. 2) a three-phase synchronous reluctance motor (10b) comprising a rotor (15) and a stator (11) having a plurality of teeth formed in an inner face thereof along a peripheral direction and in opposition to said rotor (15), six of said teeth (see A in sketch below) being in opposition to one of a plurality of rotor magnetic

poles provided in the rotor (15), there is provided at least one width reducing portion (see B in sketch below) which renders a width of a magnetic path of the back yoke portion (at numeric 11 pointed) of the stator (11) reduced relative to a width of a magnetic path of the back yoke portion corresponding to the other teeth.

Sakuma, however, failed to teach or suggest said stator having stator windings by a coil pitch corresponding to five teeth of said six teeth, and wherein in a back yoke portion of the stator corresponding to a tooth located between an adjacent pair of said stator windings which form magnetic poles in a same phase and with different polarities in a two-phase rectangular wave drive mode,

In the same field of endeavor, Nishiki teaches (in Fig. 14) stator having stator windings by a coil pitch corresponding to five teeth of said six teeth (col. 12, line 63-64; pole pitch is 6 and winding pitch is 5 for both motors). Therefore, it would have been obvious to a person of ordinary skill in the art at the time the invention was made to combine the teaching of Nishiki with that of Sakuma for reduction of torque ripple.

The references, however, failed to teach wherein in a back yoke portion of the stator corresponding to a tooth adjacent a tooth located between an adjacent pair of said stator windings which form magnetic poles in a same phase and with different polarities. In the same field of endeavor, Kazmierczak teaches (in Figs. 1-2) in a back yoke portion of the stator (10) corresponding to a tooth (between slots 15-16) located between an adjacent pair of said stator windings which form magnetic poles (poles 1 and 2) in a same phase and with different polarities. Therefore, it would have been obvious to a person of ordinary skill in the art at the time the invention was made to

combine the teaching of Kazmierczak with those of Sakuma and Nishiki for harmonic reduction.

The references, however, failed to teach in a two-phase-on rectangular wave drive mode. In the same field of endeavor, Iijima teaches in (Fig. 7) a two-phase-on rectangular wave drive mode (see waveforms h, I, j). Therefore, it would have been obvious to a person of ordinary skill in the art at the time the invention was made to combine the teaching of with Iijima those of Sakuma and Nishiki for low cost drive.

7. Claim 1 is alternatively rejected under 35 U.S.C. 103(a) as being unpatentable over Sakuma et al (US 2003/0094875) in view of Nishiki (US 6211593) and in further view of Buening et al (US 2002/0093266).

As for claim 1, Sakuma teaches (in Fig. 2) a three-phase synchronous reluctance motor (10b) comprising a rotor (15) and a stator (11) having a plurality of teeth formed in an inner face thereof along a peripheral direction and in opposition to said rotor (15), six of said teeth (see A in sketch below) being in opposition to one of a plurality of rotor magnetic poles provided in the rotor (15), there is provided at least one width reducing portion (see B in sketch below) which renders a width of a magnetic path of the back yoke portion (at numeric 11 pointed) of the stator (11) reduced relative to a width of a magnetic path of the back yoke portion corresponding to the other teeth,

Sakuma, however, failed to teach or suggest stator having stator windings by a coil pitch corresponding to five teeth of said six teeth, wherein in a back yoke portion of

the stator corresponding to a tooth adjacent a tooth located between an adjacent pair of said stator windings which form magnetic poles in a same phase and with different polarities in a three-phase drive mode,

In the same field of endeavor, Nishiki teaches (in Fig. 14, and right side sketch below) stator having stator windings by a coil pitch corresponding to five teeth of said six teeth (col. 12, line 63-64; pole pitch is 6 and winding pitch is 5 for both motors), , in a three-phase drive mode (Fig. 11). Therefore, it would have been obvious to a person of ordinary skill in the art at the time the invention was made to combine the teaching of Nishiki with that of Sakuma for reduction of torque ripple. Therefore, it would have been obvious to a person of ordinary skill in the art at the time the invention was made to combine the teaching of with Nishiki that of Sakuma for high efficiency drive.

The references, however, failed to teach wherein in a back yoke portion of the stator corresponding to a tooth adjacent a tooth located between an adjacent pair of said stator windings which form magnetic poles in a same phase and with different polarities. In the same field of endeavor, Buening teaches (in Figs. 1, 3A and sketch below) in a back yoke portion of the stator (10) corresponding to a tooth (3 or 5) adjacent a tooth (4) located between an adjacent pair of said stator windings which form magnetic poles (poles 1 and 2) in a same phase and with different polarities. Therefore, it would have been obvious to a person of ordinary skill in the art at the time the invention was made to combine the teaching of Buening with those of Sakuma and Nishiki for harmonic reduction.

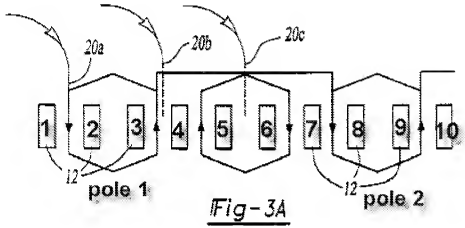


Fig-3A

8. Claim 2 is alternatively rejected under 35 U.S.C. 103(a) as being unpatentable over Sakuma et al (US 2003/0094875) in view of Nishiki (US 6211593) and in further view of Buening et al (US 2002/0093266) and Iijima et al (US 6081087).

Sakuma teaches (in Fig. 2) a three-phase synchronous reluctance motor (10b) comprising a rotor (15) and a stator (11) having a plurality of teeth formed in an inner face thereof along a peripheral direction and in opposition to said rotor (15), six of said teeth (see A in sketch below) being in opposition to one of a plurality of rotor magnetic poles provided in the rotor (15), there is provided at least one width reducing portion (see B in sketch below) which renders a width of a magnetic path of the back yoke portion (at numeric 11 pointed) of the stator (11) reduced relative to a width of a magnetic path of the back yoke portion corresponding to the other teeth.

Sakuma, however, failed to teach or suggest said stator having stator windings by a coil pitch corresponding to five teeth of said six teeth, and wherein in a back yoke portion of the stator corresponding to a tooth located between an adjacent pair of said

stator windings which form magnetic poles in a same phase and with different polarities in a two-phase rectangular wave drive mode,

In the same field of endeavor, Nishiki teaches (in Fig. 14) stator having stator windings by a coil pitch corresponding to five teeth of said six teeth (col. 12, line 63-64; pole pitch is 6 and winding pitch is 5 for both motors). Therefore, it would have been obvious to a person of ordinary skill in the art at the time the invention was made to combine the teaching of Nishiki with that of Sakuma for reduction of torque ripple.

The references, however, failed to teach wherein in a back yoke portion of the stator corresponding to a tooth adjacent a tooth located between an adjacent pair of said stator windings which form magnetic poles in a same phase and with different polarities. In the same field of endeavor, Buening teaches (in Figs. 1, 3A and sketch above) in a back yoke portion of the stator (10) corresponding to a tooth (4) located between an adjacent pair of said stator windings which form magnetic poles (poles 1 and 2) in a same phase and with different polarities. Therefore, it would have been obvious to a person of ordinary skill in the art at the time the invention was made to combine the teaching of Buening with those of Sakuma and Nishiki for harmonic reduction.

The references, however, failed to teach in a two-phase-on rectangular wave drive mode. In the same field of endeavor, Iijima teaches in (Fig. 7) a two-phase-on rectangular wave drive mode (see waveforms h, I, j). Therefore, it would have been obvious to a person of ordinary skill in the art at the time the invention was made to combine the teaching of with Iijima those of Sakuma and Nishiki for low cost drive.

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to JOHN K. KIM whose telephone number is (571)270-5072. The examiner can normally be reached on M-F 8-5.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Darren Schuberg can be reached on 571-272-2044. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

JK

/Darren Schuberg/
Supervisory Patent Examiner, Art Unit 2834